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RAY HUGHES WHITBECK, Editor
Of the Department of Geology and Geography in the University of Wisconsin

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A COMPARISON OF TRANSPORTATION ON THE MISSISSIPPI BASIN RIVERS AND THE GREAT LAKES

By A. E. PARKINS
George Peabody College for Teachers, Nashville, Tenn.

DURING the three hundred years of transportation history of the waterways of the interior of the United States, man advanced from the use of the most primitive type of carrying agent, the canoe, to the highest type of vessel, the steamboat.

TYPES OF BOATS

The types in the various stages in the evolution on the Mississippi Basin rivers were slightly different, however, from those on the Great Lakes. On the rivers the flat-boat and the keel boat were antecedents of the steamboat. On the Great Lakes the order of development was canoe, batteau (similar to the keel boat), sail boat, and steamer. The flat-boat had little place on the Great Lakes because of lack of current; while the sail boat was and is of no practical value in the commerce on the Mississippi Basin rivers, because of the strong currents, the narrowness of the navigable channel, and the numerous meanders of the rivers which make frequent alterations in the course necessary. The first steamers on both rivers and lakes were in all essentials sailing vessels with boilers, engines, and paddle-wheels added. They retained not only the model, but also sails, rigging, and even the figure heads that graced the sailing vessels. The influence of environment seemed to have been strong on the interior rivers in bringing about modifications in the steamers. The non-essentials were soon dropped and the shape of hull, type of engine, and methods of propulsion were appreciably changed. On the Great Lakes, however, sails and rigging were retained on the steamers for many decades and the model of hull has received little alteration even to-day. These differences in the evolution of the present day crafts on the inland rivers and the Great Lakes are the result of the differences in the physical conditions of the waterways navigated. The present day types represent the accumulated experiences in alteration and adaptation. Let us see how the physical conditions of these two great types of waterways

have produced differences in the types of vessels navigating them. It will also be interesting to note how these physical conditions influenced the kinds of commodities carried, the management of the vessels, the kind of government improvement necessary, and the present status of commerce on these waterways.

Geographic Influence

1. *Influence of Depth of Waterways.*—The typical Mississippi River steamboat has a broad shallow hull and draws from 3 to 6 feet of water. In order to secure a displacement sufficient for an economical load, the shallow waters make it necessary for man to build his craft very wide. The river steamers are modelled in this respect after that wonderful adaptation, the flatboat or ark, that was so much used for down-stream navigation prior to the advent of the steamboat.

In striking contrast to these shallow channels of the rivers, are those of the Great Lakes and connecting waterways and harbors. Even in their natural condition the Great Lakes waterways had a minimum depth of about 10 feet*, and in recent years the government has provided a 20-foot channel connecting the lakes, and in all the larger harbors. The lake vessel has been built to fit these conditions. The typical steamers have a draught of 14 to 18 or more feet and a hull about as deep as it is wide.

2. *Influence of Changes in Depth of Water.*—Changes in depth of water as a result of shifting of sand bars and seasonal variations are of small moment on the Great Lakes waterways. Shifting bars are common in many harbors but their formation is slow and the bars offer little obstruction to the free movement of vessels. Their control is comparatively easy. Bars are not troublesome in the connecting rivers, since these rivers flow out of lakes and carry little sediment. Most of the sediment that is carried is derived from the tributary streams. The lakes also tend to reduce the seasonal variations in water level in the connecting rivers; but variations in depths in harbors as a result of wind changes are common. Such variations, however, rarely interfere with the flow of commerce.

On our inland rivers the conditions are very different. Bars are constantly being shifted, channels changed, and the depth of water varies as much as 50 feet during the year. Every rainy spell or drought for a few days brings about a change. The navigators of the rivers, therefore, are obliged to be on the alert constantly. They must possess a thorough and practical knowledge of currents, bar formation, and surface indication of bars, and even

* Not considering the rapids of the St. Mary's River and the Niagara River.

then it is necessary to take frequent soundings to find the channel, especially in the season of low water.

On the Great Lakes waterways little attention need be given by the navigators to the depth of water. Even in the connecting rivers and harbors the vessels navigate well-dredged, buoyed, and lighted channels. The navigation of the Great Lakes waterways largely consists in laying out and selecting courses and keeping on them. In the connecting rivers the courses are laid out with respect to objects on the shores, such as trees, buildings, buoys, and range lights. Running such channels with their sharp turns and heavy traffic calls for a cool headed, resourceful navigator. It calls for mathematical precision to avoid groundings and collisions. On the open lakes the courses are run by the compass and the log.

The low water and late summer interferes greatly with the sailings on the rivers. During some seasons sailings over certain sections of the river are cancelled. The consequences of such interference are disastrous to business, driving it to the railroads, and also tending to discourage tourist traffic (few people use the river steamers except for pleasure trips).

Differences in Wharves, Docks and Crews

Perhaps the most noticeable and far-reaching influence of the wide difference in the variations in depth of water on the lakes and rivers is to be seen in provisions for wharves (or docks as they are called on the lakes). On the lakes the ports have permanent docks of piling and plank, or stones or cement. The change in water level is so slight that the wharves are at a fairly constant height above water level. On the inland rivers, wharf boats, that rise and fall with the change of water level are used. Wharf boats, however, are to be found only at larger ports. At other stopping points the slight draught and flat bottom of the steamer enable it to moor along shore almost anywhere. The huge gang plank, operated by block and tackle, bridges the gap between the boat and bank. The river steamers are thus able to make frequent stops and pick up and discharge freight at numerous points.

The lake steamers, owing to their great draught, can stop only at a few points where docking facilities are especially provided. Shipping is, therefore, concentrated at definite ports. Docks may be equipped with loading and unloading machinery and freight handlers are true longshoremen. On the rivers any such devices, to be of much use, must be carried on board the boat, and freight handlers, 20 or 30 in number, are members of the crew. The paying and feeding of such a large number of men on the river steamers to handle a few tons of freight runs up

the expense account and must be an important contributing cause to the decline of steam shipping on the rivers. On the lakes each freighter carries a few deck hands (2 to 6) to aid in handling the boat at the docks, pass coal, paint, and scrub; but on the rivers the deck hands or freight handlers are not engaged in any profitable work between ports. Berths and dining tables are not provided on the river steamers for lack of room and living conditions for the crew are very unsanitary. Only a low order of workmen will ship as a freight handler on the Mississippi River steamboat. Such conditions are in striking contrast to the sanitary, comfortable quarters furnished the sailors on the lake freighters. On the lakes the concentration of traffic at a few points makes possible the erection of warehouses for freight. Even very small ports are provided with shelters. On the rivers, though all the wharf boats are provided with roofs and are, therefore, large floating warehouses, there are so few of them that most of the freight is shipped and received on the banks of the rivers and such freight is frequently exposed for several hours or days to the inclemencies of the weather. The result to most commodities is only too apparent.

At nearly all the lake ports the docks are topographically on the level with the business sections, the cities being built on lacustrine plains and not subject to flooding. The transfer of freight between the city warehouses and stores and the docks is easy. As a protection against floods, most of the cities along the rivers are built, if possible, above the high water level. Only during seasons of high water is the traffic handled on the topographic level of that of the business sections. During seasons of low water freight must be handled up and down a slope 20 to 50 feet high. This disadvantage is greater where the river is bordered by a levee, or the port is built on the river bluff. The difference in the cost of handling freight at these two terminals is no mean item.

3. *Influence of Storms.*—Storms, unless of exceptional violence, have little influence on shipping on the rivers. Boats are rarely "wind bound" or held in port as a result of high seas, nor does man feel the necessity of adjusting the model of the boat to combat the waves. The freeboard of the river boat is low and there is little bracing in the hull, for the hull is never called upon to stand the strain of riding the crest or bridging the trough of a huge wave. The flimsy structure of river steamers is shown in the havoc wrought by "sawyers" or snags. There is no need of protecting the cargo from heavy seas. It is piled up for the most part on the fore deck or on the deck beneath the superstructure.

The high seas that are common during and after every heavy wind on the lakes call for a fairly staunch craft, a high freeboard, and the protecting of the cargo from the waves. Cargoes that are likely to be harmed or washed away by the waves are stored in the holds of freighters and the hatch covers are made nearly water tight. A Mississippi River steamboat would last but a short time in one of our lake storms.

The navigators on the lakes are by necessity accomplished weather students in comparison with their compatriots on the rivers. They are not only possessed of a fair understanding of the general principles of storms, but they are close observers of the barometer, and rely to a certain extent upon practical weather proverbs, a legacy of the days before the government became the national weatherman. The river navigators, judging from recent close observation, have little more interest in the weather than the average landlubber.

4. *Influence of Physical Condition of Waterways on Types of Government Improvements.*—On the Great Lakes improvements in the channel are necessary in the connecting waterways of the lakes and in the harbors, most of the latter being at river mouths and subject to some silting. Improvements have been expensive, however, because of the great depths needed to accommodate boats that are built as a partial response to the deep waters of the lakes. The early vessels were small and had only a slight draught. But increasing commerce demanded larger vessels and these called for deeper channels. A 20-foot channel has been provided, as previously stated.

In harbors government improvements are represented chiefly by dredging where there are no rivers or where the rivers are too small to accommodate the demands of modern shipping. Where harbors were likely to be difficult to enter in times of storm, breakwaters or piers, forming artificial harbors, have been constructed. Such breakwaters are to be found at Buffalo, Cleveland, Harbor Beach, and other places.

For safeguarding the shipping, lights and buoys are freely provided. Lights and buoys along the channel of the rivers connecting the lakes are especially numerous. Navigation in these channels at night is made possible by a series of range lights. The great commerce and the great capital involved in each craft and cargo (some cargoes are valued at more than $2,000,000), the great depths demanded by the crafts, and the great momentum of the vessel with its cargo, all demand precision in navigating the connecting waters and harbors of the lakes, and also call for numerous safe-guarding devices. About the shores of the lakes, at

entrances to harbors and connecting rivers, or on headlands, islands, and at turns in the regular courses of the vessels, the government maintains numerous light houses and beacon lights, which, like those along the shores of the ocean, are of long-range visibility (10 to 20 miles).

On the inland rivers range lights are little used. Lights of a small candle power are provided along the channel, placed alternately, for the most part, at the bends. The shallow draught of the boats and the broad channels call for few buoys. At night the channel is searched out by means of the search light and an occasional sounding. The frequent changing of the channels of the rivers and the slight commerce do not warrant expensive improvements of a permanent nature. Wing dams of loose boulders built out from the banks and between the islands serve to confine the water to one channel, narrow the channel, and scour out the bottom. In some sections dredging is necessary. Owing to the frequent changing in the position of the bars and the river channel itself, improvement is almost a hopeless task. The upper Mississippi and most of the Ohio have much more permanent channels than have the Missouri, the lower Mississippi, and other rivers. Slack water dams are much used along the Ohio. Permanent dams and locks are provided at some of the rapids as at Louisville, Keokuk, and Rock Island.

5. *Influence of the Type of Commodities Carried.*—On the lakes, iron ore, coal, lumber, grain, flour, salt, and stone are the dominant commodities carried and are offered in immense quantities. In addition to these there are miscellaneous and package freights. The Great Lakes vessels offer rates on many commodities so much lower than do the railroads that the lakes have almost a monopoly. In 1915 the vessels of the Great Lakes transported 47,500,000 tons of iron ore, 26,000,000 tons of coal, 300,000,000 bushels of grain, 460,000,000 feet of lumber, 15,000,000 barrels of flour, and 1,000,000 tons of miscellaneous and package freights. With such an immense tonnage and the concentration of traffic at a few ports special devices for the handling of these with dispatch and economy, as previously stated, are possible. At one of the Lake Superior ports 10,000 tons of iron ore have been loaded in 35 minutes. Grain and coal, each has special machinery to minimize the cost in money and time in trans-shipment. Lumber is still handled by hand, piece by piece, and there is little improvement in the handling of flour and package freight. Hand trucks and even electric trucks are used where possible and, as previously stated, the work is done by experienced, well paid freight-handlers.

Most of the tonnage on the inland rivers is miscellaneous freight (farm products, furniture, farming utensils, and such commodities) and package freight. No iron ore, and relatively little coal, except from the Pittsburg region, are shipped. Very little lumber is now transported in the form of rafts, either in the log or in rough boards and planks. Grain and flour go mostly by rail. The nature of the freight handled on the rivers will not allow the use of such mechanical devices as are found on the docks of the Great Lakes, nor are the freight handlers as efficient. The truck is rarely used. Through custom or necessity, or both, nearly all freight is carried by hand, one piece, whether weighing one pound or two hundred pounds, being the regulation load. It is not an uncommon sight to see a burly negro toting the handles to a plow, followed by another with the metal parts. One would not be surprised to see another make a 300-foot journey with the wrench were not that tool wired to the handles.

Passenger traffic (mainly tourists and excursionists) is large on both the lakes and the rivers. Passenger vessels on both types of waterways transport miscellaneous and package freights also. Such freight makes up, as previously stated, most of the commodity traffic on the inland rivers. Since the tonnage of bulk cargo commodities is so slight there is no demand for a special type of boat for such commerce. Freight is being carried on river boats that have been built primarily for passenger traffic and not at all adapted to the handling of freight. Many suggestions have been offered as to improvements in the carrying agents on the rivers, but little can be expected until bulk cargo commodities increase sufficiently to warrant the use of special types of freight boats, and there seems little prospect of any great increase in river traffic in the near future.

Decline in River Traffic and Reasons

In the last few years there has been a steady decline in the tonnage in spite of the active work of associations and commissions and the apparent need of increased transportation facilities in the country at large. The following data show the tonnage in 1901 and 1914 on the lower Mississippi:

Commodity	*Section of river*	*Tonnage in* 1901	1914
Grain	St. Louis to Cairo	137,954 tons	17,909 tons
Cotton	Vicksburg to New Orleans	71,925 tons	8,345 tons
Cotton seed, etc.	do.	60,936 tons	12,238 tons
Coal and coke	do.	1,225,970 tons	669,589 tons
Groceries and provisions	St. Louis to Cairo	83,656 tons	5,967 tons
Miscellaneous freight	Vicksburg to N. O.	137,557 tons	62,484 tons

Only in gravel and stone was there an increase in tonnage in the 13 years. A Memphis paper has recently announced (June, 1917) that the only packet between Memphis and New Orleans has suspended sailings, and the steamboat line operating up stream from Nashville is likely to lay up its boats because of lack of support of the shippers. There are many reasons for this decline, going on since about 1860, chief among which is the fact that the region tributary to the rivers of the Mississippi Basin do not produce the commodities that may be carried most economically by the waterways. Could the rivers have the commodities that go to make up the traffic of the lakes they would assume a rank of far greater importance in the transportation world. Moreover, the rivers do not occupy an advantageous position with respect to the great producing and consuming areas. The Great Lakes connect great wheat fields, iron mines, copper deposits, and pine forests with flour mills, blast furnaces, and steel mills and a large manufacturing and consuming public. The rivers run for the most part through a land of farms, with few commodities that can be carried easily and economically by water.

Characteristics of Lake Navigation

Lake navigation has many of the characteristics of that of the ocean. The large areal extent of the lakes makes them veritable "Inland Seas." Fogs, which frequently settle over them, in which ships must lie idly and wait or attempt to work their way perilously and slowly through, give one a touch of the experiences on the Newfoundland Banks. At times when the "glass" goes down and the wind drives the surface into huge waves that sweep over the decks of the vessels, keeping them awash, one experiences a bit of the stormy Atlantic. The tales of wintery ocean voyages are no more harrowing, no more exciting than those of voyages on the lakes in the late fall. Few acquainted with lake traffic in late years will soon forget the tragedy of the November storm of 1913, when more than a score of lake freighters with their crews were lost, some not leaving a single piece of wreckage or a body to indicate their resting place.

Although there are no passenger vessels on the lakes that can compare in size with the Mauretania or Olympic, there are many passenger liners that are as large and as luxurious as the average ocean vessel. Like the ocean liners, they carry both passengers and freight and maintain a schedule with the regularity of an express train. They rely upon regularity and service to attract traffic. Coasting vessels of small size that do a continual "drop-in" business with the small lake shore towns are fairly numerous

on the lower lakes where there are numerous towns and the population density is sufficient to warrant a fair amount of freight. Then there are the "tramp" steamers that carry commodities in cargo lots. Some of these "tramps" are operated by small companies that own but one or two ships. In some cases the tramp has a captain owner who serves also as a supercargo and drums up trade much as the New England skippers did in early days when the American flag flew on the "Seven Seas." In the last two or three decades, large corporations, most of which have grown from humble beginnings in lake shipping, have arisen. Lumber companies, grain dealers, mining companies, and railroads (now prohibited from engaging in lake traffic) also have invested large amounts of capital in fleets of lake vessels that are operated in connection with their business. The vast holdings of the Steel Trust in iron deposits in the Lake Superior region and its numerous furnaces on or near the south shores of the lakes enable it to utilize its fleet with great profit and to manage it on a scale the most business like and economical to be found in the world.

Lake commerce to-day shows modern America at work. It spells organization, activity, progress, more ships, bigger ships, larger cargoes, lower rates, and thus cheaper iron. coal, flour, and other commodities to the consumer.

Lake and River Navigation Contrasted

On the inland rivers all is different. One can never get away from the land. The cooling breezes that make a lake voyage a pleasure during the hot summers are not experienced. The scenery, the colors, the forms, the horizon, is dominantly a *land*scape. Nor does one experience much of the hustle and bustle that is characteristic of American life. A trip on the Mississippi River, however, is not without its pleasant experiences. It is a voyage in the romantic past. It carries one back to the 50's and 60's of the last century, for there have been few improvements or changes in the design of hull, in management or handling of freight in the last 50 years. The steamer winds its way leisurely around great bends, or across the channels to avoid bars, channels ever changing yet remaining the same in their deterrent effect on commerce. Here and there on terraces or bluffs are villages or towns whose life is inseparably linked with that of the river. The ramshackle buildings evince a departed prosperity. Other river cities, served by railroads, with smoking chimneys of busy factories bear every stamp of a busy industrial life. One passes wooded islands, broad flats, and lofty cliffs. Many of the scenic

features rival those of the Rhine. There are many sites and situations associated with Indian legends or heroic deeds of the pioneers. It is mostly of the past that we are told, of the days before the railroad, when the rivers were travelled by hundreds of boats carrying goods for the Indian trade, valuable furs and peltry, provisions for the trading posts, missions or forts, and products of the ranch and farms; of luxurious steamers crowded with immigrants, travelers, and men on business trips, and of exciting races.

That the rivers of the Mississippi Basin will ever become the great highways of commerce that they were in the 30's, 40's, 50's is a mooted question. Many men, captains and vessel owners, who have for years been associated with river traffic in all its phases, see little prospect for any great revival. They are not half so certain of the future as are the members of transportation boards of our river cities, secretaries of waterway commissions, and "pork barrel" congressmen. These men of experience, at least many of them, look upon the story of the river traffic as a completed chapter in the transportation history of America.

United States Expects to have 1,600 Merchant Ships, Aggregating 9,200,000 Tons, Near End of 1918

The United States has to-day 458 ships of over 1,500 deadweight tons with an aggregate tonnage of 2,871,359, either engaged in or capable of participating in foreign trade. There are also 117 ships of a tonnage of 700,285 of German and Austrian origin. The United States Shipping Board Emergency Fleet Corporation has commandeered nearly 400 steel ships of more than 2,500,000 tons, which are being completed or under contract for construction in American yards. The Board's Fleet Corporation has also contracted for 636 ships with a tonnage of 3,124,700. Totaled these figures show that the United States will have near the end of 1918 a merchant fleet of more than 1,600 ships aggregating 9,200,000 tons to carry its foreign commerce, as compared with an overseas marine of 1,614,222 tons on June 30, 1914, scarcely a month before the European War began.

The tonnage referred to is exclusive of that engaged on inland waters, unsuitable coastwise ships and small craft operating along the coast and in bays and harbors, and does not, of course, include the prospective additional program of the Emergency Fleet Corporation.

THE NITRATE INDUSTRY OF CHILE

By W. R. McConnell,
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CHILE is one of the few progressive and promising countries of South America. With Argentina we associate great agricultural production and possibilities, fields of wheat and corn and flax and droves of cattle and sheep, and from Brazil comes nearly three fourths of the world's supply of coffee and a third of its rubber. Chile, too, has an industry which forms the backbone of her national progress, the nitrate industry. The nitrates exported from Chile constitute about 60 per cent of the total value of all her exports, and the revenue derived from export duties on these shipments is from 70 to 80 per cent of the total annual government revenue.

The Four Sections of Chile

Chile is a long, narrow country stretching for about 2,500 miles along the Pacific from 18° south latitude to the extreme south end of South America. Its average width is only about 100 miles. For convenience it may be divided into four zones: (1) The desert zone which is a continuation of the desert coast of Peru, extends to about 27° south latitude; (2) the mountain belt from 27° to 33° contains copper and other valuable minerals; (3) the central or agricultural zone extending from 33° to 42° contains the best agricultural lands of Chile. The "vale of Chile" in this zone is similar in many ways to our Great Valley of California; (4) the island portion from 42° to the southern end corresponds to the western coast of Canada and Alaska.

The desert zone is usually referred to as the desert of Atacama. It lies on the western side of the Andes Mountains in a region where any winds from the east or southeast must pass over the mountains precipitating their moisture on the eastern slope and descending on the western side as drying winds. Flowing along the western shore of the region is a cold ocean current, and any winds which might blow from the Pacific over the land would tend to take up moisture rather than to precipitate it. Moreover, the region lies in the dry horse latitude belt. For these reasons northern Chile is one of the most absolute desert regions in the world; scarcely a plant grows there. A writer who visited there in 1912 says that parts of it had not had a drop of rain for 10 years; but other places have occasional light showers almost every year. Commonly such a region would be useless to man. This desert, however, is far from useless; on the other hand it is

the most valuable part of Chile, for in this desert are found the beds of nitrate of soda or Chile saltpeter.

The nitrate deposits are found on a plain between the coast hills and the Andes Mountains. In general they occur near the eastern base of the coast hills in a belt extending from about 19.5° to 26°, or about 450 miles. The width of this belt is usually less than 10 miles. The deposits are by no means continuous over this entire length. Some of the beds are within 10 miles of the Pacific coast and some are as much as 60 miles from it. The altitude of the deposits is from 2000 to 4000 feet above sea level. The nitrate of soda for which the deposits are worked finds a use in the manufacture of explosives and as a fertilizer.

Theories of Origin

Regarding the origin of the nitrate beds there is much difference of opinion among those who have studied the region and written on the subject. One theory is that the region was once the floor of an arm of the ocean, which was later entirely shut off from the sea by the rising of the land. Around the shores of this lagoon millions of birds deposited guano just as they are now doing along the coast of Peru. These accumulations of guano contained the nitrates which later were dissolved by streams and rain and carried into the lagoon, where the nitrates were concentrated as the water in the lagoon evaporated with the progressive aridity of the region.

Another theory is that the nitrates resulted from the decomposition of marine plants which accumulated in the basin. Perhaps both the guano and the marine plants played a part in the formation of the nitrates. Still other theories have been advanced in attempts to account for the origin of the deposits but they will not be considered here.

Whether or not the arid climate was responsible for the formation of the nitrates, it is certain that they exist there to-day because of the dryness of the region. Moderate rains would in a comparatively short time dissolve and carry them away.

The nitrate beds are really beds of rock which contain the nitrate. This rock is known as "Caliche" and from 10 to 60 per cent of its composition is nitrate of soda. The beds of caliche are commonly from 5 to 10 feet below the surface and are covered with a mantle of rock fragments, sand and salty deposits. In thickness the beds range from 1 to 6 feet.

The crude caliche is quarried or blasted from the earth in big chunks which are taken to plants where they are crushed

into small fragments in preparation for extracting the nitrate. There are about 100 of these nitrate plants or "oficinas" operating in northern Chile. In these plants the crushed caliche is boiled in water for about 20 hours. The liquid containing the soluble nitrates is then run into great pans and left there for several days. As the water cools the nitrate of soda crystallizes and collects on the bottom and sides of the pans; then the liquid is withdrawn and the crystals scooped out and dried for a few days, when they are placed in bags, weighed and stamped and are ready for shipment. The dry crystals contain about 98 per cent of pure nitrate of soda. A large modern plant will prepare about 200 tons of nitrate daily.

Since the nitrate industry is carried on in an absolute desert, all of the necessities of life and all of the equipment needed for the plants must be brought in from the outside, and water is generally piped from mountain streams 100 to 200 miles distant. Some water for the plants is obtained from wells sunk in the desert, but this is a comparatively small amount. Water was formerly brought by means of trains or pack animals from coast towns, whither it was carried in ships. Coal for running the plants formerly was imported from England and the United States, but recently crude oil has largely supplanted coal as a fuel; much of this is obtained from California. Some of the oil from Peru was used but it is so desirable for the production of gasoline that at present some oil is shipped from Peru to California where it is refined and the residue is returned for fuel for the nitrate industry. The nitrate centers are all reached by railroads from the coast. The ports from which most of it is exported are Antofagasta and Iquique. Antofagasta is the largest of the Chilean nitrate ports, with a population of about 60,000. Iquique is a town of about 50,000. Taltal and Tocopilla are minor shipping ports.

Chile has not always had a monopoly of the nitrate industry. Up to 1884 the most important beds were within the bounds of Peru and Bolivia. In 1879 a war was waged by Chile against Peru and Bolivia; at the termination of that war in 1884 victorious Chile obtained as a war indemnity, Tarapaca from Peru and Antofagasta from Bolivia, in which districts are found most of the nitrate beds.

Notable progress has been made in the industry since Chile obtained the nitrate fields. At the time of the war in 1880 about 226,000 tons of nitrate were exported annually. In 1890 more

than 1,000,000 tons were exported. The exports for 1912 reached 2,400,000 tons and in 1916 more than 3,000,000 tons.

Since 1850 more than 50,000,000 tons of nitrates, valued at $2,500,000,000, have been shipped from Chilean ports; 80 per cent of this has been utilized for fertilizing purposes. It is conservatively estimated that Chilean nitrates have contributed $4,000,000,000 in the way of increased agricultural production of the world.

For 30 years following 1880 the revenue collected by Chile as export duties on nitrates amounted to $300,000,000. At present the export duty is 55 cents per hundred pounds, which amounts to about $30,000,000 annually.

The nitrate industry is a capitalistic industry. A large plant fully equipped is estimated to cost about $1,400,000. A great deal of foreign capital is invested in the district. The following is a list of nationalities and the capital each has invested:

Chile	$55,000,000
England	50,000,000
Germany	20,000,000
Other Nationalities	25,000,000

There is but one American company operating in the region. The industry employs, in normal times, more than 50,000 men. The daily wages of these men range from $1.40 to $2.40. Most of them are natives of Chile, Peru and Bolivia.

Previous to the present European war most of the nitrate was shipped to Europe, and Germany was the greatest consumer. In 1912 about 80 per cent of all the nitrate exported from Chile went to Europe. When the war broke out many of the plants shut down, but later the United States began buying and at the present time is the greatest consumer of Chilean nitrate; the prices paid for it in 1915 ranged from $1.38 to $2.39 per hundred pounds.

Iodine is a by-product of the nitrate industry. It is obtained from the liquid in which the caliche has been boiled. In 1916 about 1,000,000 pounds of iodine were exported from Chile.

NOTE.—In the December (1917) *Geographical Review*, p. 486, Prof. Walter S. Tower has a discussion of a New Theory of the "Origin of the Chilean Nitrate Deposits." Briefly stated, this theory holds that "the deposits are the result of efflorescence from ground water, the minute nitrate content of the ground water being accumulated as a result of evaporation." This theory like all the others encounters opposition.—*Editor*.

PHYSIOGRAPHY AS A BASIS FOR COMMERCIAL GEOGRAPHY, BOTANY, AND HISTORY*

By Alison E. Aitchison
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AT a time when the tide of physiography in the high schools is receding, perhaps it may be beneficial to consider to what extent this branch of science servees as a basis for other studies. We are spending and have spent much time and energy and gray matter in trying to prove through endless magazine articles and speeches that first this, and then the other science, as taught in high school, is a pitiful failure. Is not any science, either in high school, or university a failure if it does not help to develop in the student (1) some ability for clear logical thinking, (2) some interest in the subject pursued which shall follow him out into life, and (3) some realization of the adaptation of all things to their environment and of man's place and possibilities in the scheme of the universe? The present outlook indicates that if we do not spend some little time in trying to solve the problem of how our sciences, properly arranged, may be made to help one another in such a way as to save time and to make the science work of the high school years one strong coherent whole, we may find the whole science group discredited, while we sit around and discuss. The student may forget even before he reaches college most of the facts he has learned; many of us did, but that is not the criterion of success in high school science.

Let us take up the subject of commercial geography by sketching briefly a course in that subject which would be fitted to most ordinary high schools. First a discussion of the physical factors affecting production and transportation. These factors are primarily the location, the climate, the soil, the topography, and the mineral resources of a country. From these as a basis we go on to develop the great industries and commodities of commerce as they are influenced in their production and exchange by these physical and other non-physical factors. Thirdly we consider the great routes of trade as located and developed or retarded by these same physical factors. These factors determine what the agricultural products will be, the cost at which they will be produced and the extent to which agriculture will be the leading industry.

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* Paper read before Science Section of the Iowa Teacher's Association, 1917.

To show more specifically what is meant, take corn among the agricultural products. What climate and soil factors determine the location of the corn producing regions of the United States and the other corn countries of the world? To what extent and how does the topography of the country influence the routes and the cost of transportation the prices and the ultimate use of the crop? What other factors besides these physical ones determine the corn production and the purposes for which it is grown? Density of population, for example, is a question which can never be ignored. A question, pertinent at the present time, "Why is the United States government asking us to use corn in order that wheat may be sent to the allies? Why not send corn to the allies and use the wheat ourselves?" brings out very clearly the interrelation of climatic conditions, commerce and a nation's food habits. A little study shows that with the exception of Italy, the lower Danube basin, and extreme southern France, none of these countries have climates for the production of corn, and therefore the people are not used to depending on it as a food. Other factors of course enter into the problem, such as the bulkiness of corn and its keeping qualities, but this serves as an illustration. It is readily to be seen in the suggested study of corn that the background of physical geography is in constant use, in reference to topography, to soil and the elements which make it up. Take the one point of climate, we say the location of the corn belt is largely dependent on climate, but that is such a complex thing. There are so many possible phases of climate which may be the determining factors and unless the student has made some study of weather and climate at some previous time he has only a general idea of what is meant, and much time must be spent in developing the true notion.

Take again the first of the physical factors mentioned—location. In one of the well-known high school texts in physiography, one of the first subjects taken up is the origin of the continents and their location with regard to the greater and lesser oceans and the arrangement of highlands. These facts carried into the realm of commercial geography are pregnant with meaning. The mere location of the United States with regard to latitude is of supreme importance in deciding our fate as a producer of agricultural products. Of almost equal importance is the position of this continent with regard to the other continents, as the handicap of distance is one which can never be wholly overcome no matter what our means of transportation are.

For commercial geography, the case then seems clear, everywhere it rests on the basis of physiography a knowledge of which

lightens the work of both pupil and teacher and makes the course much more scientific and much more effective.

For the botany teacher it is equally desirable that the student have had a good course in physical geography. Especially is this true since the trend of high school botany is in the direction of the ecological phase of the subject for which a knowledge of land forms and the processes going on, on the land is so necessary. The very terms "the flora of flood plains, of young valleys, of hillsides, the relation of plant societies in the different horizons of a swamp," show that a knowledge of physiography is essential. How much better it would be if the student had this before attempting the botany work. A glance at the table of contents of a new text book in biology—not intended for high school, it is true—written by one of the leading biologists of the country for elementary college classes, shows very clearly the trend of the biological sciences at this time. A chapter headed "Aquatic Environment" contains the following suggestive sub-titles: Lakes and Ponds, Lakes Temporary Phenomena, The Great Lakes, The Finger Lakes, Flood-plain Lakes, Streams, Gradient of Stream-Bed, Ice in Stream-Currents, Silt. No comment on the physiographic basis of this is necessary.

In turning to history it seems almost unnecessary to point out specific illustrations, so clear is the evidence of the relation of these two studies. In discussing the physical geography of a country we are talking of the stage on which its history is played and the properties with which the players deal. We see the stage as it is set for the birth, the development and perhaps the downfall of a nation. We discover the agents which have painted the scenery and set the stage and if we are interested we may watch the players enter right and left, advance to the front, meet and greet each other.

Let your imagination wander for a moment in this way over North America. North America in the geological ages of the past is emerging from the ocean; hundreds and thousands of years are passing. North America acquires a soil, rivers carve great valleys and the surface becomes more and more rugged. The continent is supplied in the course of time with great forests from some of which fields of coal are formed. Percolating waters have brought together beds of iron, of lead, and of zinc; the sinking of the coast line has given a succession of harbors, while the erosion of rivers has helped to develop waterfalls. The Red man comes upon the stage; he does nothing to develop the natural resources of the country. We will let the curtain fall upon the first act.

The curtain rises. New players now appear. At an entrance far to the north, coming in by the way of the mighty St. Lawrence, enter the French actors while along the eastern coast the English players step into view. Both advance toward the center of the stage and the dramatic phases of the play are on. But what a contrast in the rate of advance. With almost incredible rapidity the French come up the great highway of the northern river and cut through the long stretches to the heart of the continent. How very, very long the English tarry in the narrow strip of country between the coast and the Appalachian mountains and with what great political and economic results that stay is fraught. Only a knowledge of the lakes of Canada, the great abundance of waterways, and the utter lack of highland barrier can completely explain the Canadian French advance, and how much better it is that that knowledge should not be the mere fact that these lakes exist, but an intelligent interest in the long series of geographical events to which their existence is due. A study of why the low Appalachians were for so long a complete barrier to the English, depends again on a knowledge of the topography and history of the Appalachian mountains, the origin and peculiarities of their passes. At every step the early history of the colonists was conditioned by geography. How immensely different were the rough boulder-strewn hills of New England from the low coastal plains of Virginia and the Carolinas. How different in their effect were the rapid, high gradient, non-navigable streams of New England and the sluggish rivers of tidewater Virginia. Every forward step from the Atlantic to the Pacific was modified in some way by the physical features of the continent.

May we not then arrive at this conclusion—that if physiography is taught in the high school by a teacher who has a knowledge of and a sympathy for the subjects which are to follow, in addition to his or her knowledge of and interest in physiography itself, that time will be saved, interest will be awakened and unity will be gained. If general science as a first year high school subject can so interest the pupil in physiography that it will again come to its proper place in the high school curriculum following perhaps that first year's work, then general science will have done physiography a good turn. But physiography itself must change its habits and cease to be a dry book subject, taught by any teacher who has spare time, and become a real vital thing which touches and conditions life at every point.

A NEGLECTED DUTY OF THE GEOGRAPHY TEACHER

By Hannah Lindahl
South Bend, Ind.

THIS is the age of practicality, the time when training for direct usefulness and servicce is emphasized, the days when one hears much of vocational education and guidance, and all are most commendable; but in our keen desire to be practical let us remember our supreme privilege and first duty,—that of instilling in the heart of the child a love for his brother, regardless of nationality, color, or creed, the world o'er.

Upon no other teacher of a subect in the school curriculum does the responsibility for securing this sincere respect for all mankind rest with such meaningful opportunity as upon the teacher of geography, for it is here that the child learns to know his brother and sister in the distant land, and largely upon the teacher's introduction and presentation of this stranger to the child in our school depends the tone of brotherly feeling that will sound forth from the hearts of these future citizens.

It is a stigma upon those of us who vauntingly boast of our Americanism as a type of civilization greatly superior to that found in any other nation or race. It is a rightful pride that spurs the American youth to greater service for his country so that he may truly eulogize it as the symbol of liberty, justice and truth; but a wrongful pride that is permeated with the spirit of bumptiousness which says to him of another nation or people of a different color, "Behold my superiority."

Need I call many witnesses to prove that this is no false accusation, no chimera? Am I constructing against the conceit of the American child, yea, even adult, a case without proof? Only look about you, the evidence is strong, and the verdict pronounced—guilty.

To our shores have come many of these stranger brothers, and again and again have we applied to them terms of disrespect. The average American child, who fails to realize that he, too, is not very far removed from some immigrants to this country, speaks of the Italian as the "Dago"; the emigrant from Poland, a "Polock"; the Chinaman, a "Chink"; the Jew, a "Sheeny," and we might enumerate others. These are too often applied in a contemptuous manner that seeks to brand the so-called with a stamp of inferiority.

The question arises,—how is the geography teacher of to-day exerting her influence upon this problem? Is she condoning this spirit of false Americanism; is she pusillanimously tolerating it; is she, in a negative manner, merely suppressing such utterances; or is she helping, in a positive way, by giving our boys and girls facts about the excellence of these people in certain lines of endeavor, facts on which the American youth may build a genuine appreciation of his fellow men? Are we, as teachers of geography, training our children to be Pharisaical, or are we uniting our efforts to eradicate this spirit? Are we merely talking the brotherhood of man, but by our daily words and actions proving that it is not a deep conviction within us?

It is just here that the truest and noblest work of the geography teacher is found. We all acknowledge the importance of emphasizing certain basic geographical facts in the teaching and mastery of this subject, but if the child leaves our class at the end of the semester or term with a fund of geographic principles and statistics but with no greater love for his brother, with nó truer conception of what superiority means, the dominant purpose of the course has been defeated.

It is in geography that the opportunity presents itself to stress the contributions made to civilization by the various nations and races, and thus to establish proof that it is not position on any certain continent, nor utterance of any particular language, nor number of pigment cells in the skin that determine the greatness or superiority of individual, nation or race.

As it is that individual who has made the most of all opportunities who is named among the truly great, so is it with individuals collectively, the nation. If the geography teacher shows the child how much China has contributed along the lines of agriculture and civil service, what the world owes to Italy for her accomplishments in art and architecture, how the Jew has preserved much for us in religion and ethics, the American youth will come to an appreciation of these peoples and his heart will beat with the feeling of gratitude for their part in the onward march of civilization.

To give boundaries, to locate cities, to draw maps, to give geographically cause and effect, require the training of hand and head; but to feel akin with the whole world, to acknowledge one's debt of gratitude to other peoples, is the result of heart training, and not until this has been accomplished by the teacher of geography has she shown herself worthy of her high calling.

HONG KONG

HONG KONG is a granite island with an area of 29 square miles just off the coast of southern China and just south of the Tropic of Cancer. Out of a population of 300,000 people, two to three thousand are English, 2500 are Portuguese, and the remainder are Asiatics, mostly Chinese. Since the central part of the island rises to an elevation of 1800 feet, settlement is almost wholly confined to the coast. On the northern shore is located Victoria, the capital and the only important city, with a population of 166,000.

In 1841 the English acquired Hong Kong Island from China. The English regarded the possession of a port on this coast as a commercial and political necessity in order that they might retain a firm hold upon the trade of the East. In 1860 a small portion of the mainland was added, and in 1898 still more of the mainland and several islands were leased for 99 years. In 1841 there were only about 2000 fishermen, farmers, and pirates living on the island. Since then the English have developed the city into a healthful port, and the greatest entrepot of the far East.

The harbor of Victoria is especially well suited to the requirements of trade on a large scale. It has an anchorage of over 50 square miles, which could shelter one-half the ships of the world. It is protected even better than Gibraltar; it is usually guarded by a strong fleet of men of war and possesses immense concealed fortifications.

The harbor is really a section of the city of Victoria, because it is the home of 10,000 junkmen, cargo-shifters, ferrymen, and fishermen, with their families. In the day-time they shift about the harbor and along the coast and carry on their trade; at night they assemble their boats in their proper places along the shore where they anchor for the night.

Hundreds of steamers, junks, and sampans, or Chinese rowboats, ply back and forth from coast ports and interior river cities of the East and collect and distribute the vast quantities of merchandise which pass through the port of Hong Kong. Since the wharves are meagre and labor is cheap, the junks receive their cargoes directly from the ocean steamers. In ordinary times the harbor of Victoria contains from 50 to 75 ocean-going vessels; nearly half of these are British, about one-fifth German, and one-tenth Japanese.

Absolute free trade is the key note to Hong Kong's great importance as an entrepot. It is estimated that half a million boats of all kinds enter the port each year. In a normal year the sum

of the shipping that enters and clears amounts to about 21,000,000 tons. This is surpassed only by New York, Antwerp, Hamburg, and Rotterdam, and sometimes London.

Hong Kong is a great transfer point for ships much as Chicago is for railroads. Through this port England carries on an enormous trade with the far East. Practically all the ships sailing between the West and China have Hong Kong as a port of call. The merchandise is distributed directly to the Chinese cities or is stored in great sheds, called "go downs." Hong Kong itself has been termed a huge protected "go down." The island boasts of the largest docks in the Orient. It has almost a monopoly of the docking business because these docks can accommodate the largest steamers and men of war.

There are several reasons why Hong Kong is so important: (1) It has a large and excellent harbor; (2) it has absolute free trade, not even having a custom house; (3) commerce is protected by the English government; (4) it is situated in a central position for collecting from and distributing to the far East; (5) labor is cheap; (6) the English have made Hong Kong sanitary and safe for Europeans; (7) it has the largest docks in the East.

Quoting from Curtis, "Hong Kong is a monument to British enterprise; a realization of the British ideal of colonial government; an asylum for the oppressed; a hospitable home for wanderers of every race and nation, where freedom, toleration, and other virtues are exemplified in the highest degree; where people can come and go at will without answering questions; where there is no custom house and no regulations to interfere with the comfort and convenience of travelers." F. W.

The Expansion of Industry Already Achieved in England

The national production in Great Britain has increased 30 per cent over normal times, and with the assistance of 30 per cent less of the male population. Those very remarkable figures would have been impossible without the valuable help of women. The amount of work which is being done by women in industrial plants is enormous, and it has increased the efficient supply of munitions. Then, with regard to coal, the nation is producing within 10 per cent of its pre-war standard, though thousands of miners have gone into the army, and others are not working all the time they might. The pig-iron output, in spite of the depletion of labor, is normal, and mills are actually turning out 20 per cent more steel than before the war. All these are very encouraging figures from the point of view of the future development of the country.

THE REMARKABLE ISLAND OF JAVA*

JAVA is the most important, though not the largest, of the Dutch possessions in the East Indies. It is an island about the size of Cuba, and more than four times the size of the mother country, Holland.

Its people are almost entirely of the native Malay stock, the European population not exceeding 100,000 out of a total of more than 30,000,000. The Europeans, of course, control most of the business and industrial enterprises. The prosperity under European domination is shown by the great increase in population which has taken place during the past hundred years or more. For several generations their numbers have doubled every quarter of a century, without immigration. The density of the population now averages nearly 600 to the square mile. Some of the native princes still maintain their authority, subject to the Dutch governor-general, and retain their palaces, courts, and hosts of retainers.

Communication in the interior of Java is good, as there are about 1500 miles of railway, almost all of which is owned by the government. Batavia, a city of 140,000, situated near the western end, is the principal commercial center of the island.

The cultivation of sugar is a very old industry in Java, and has seen many vicissitudes. There are some 200 sugar plantations on the island, with an acreage planted in sugar in excess of 400,000. The sugar factories are equipped with the most up-to-date machinery. They produce for export about 1,660,000 tons.

Next to sugar perhaps the most important of Javan products is rubber. The plantation system is universally applied to rubber growing. The first rubber plantations were laid out about the year 1900, and the growth of the industry has been extraordinarily rapid. In 1914 there were over 400 rubber estates, with a total planted area of 154,000 acres. British capital has gone very extensively into this industry and some of the British companies have made enormous profits. At the beginning of the war the importation of rubber into Holland was prohibited. The market for this commodity was thus shifted from Europe, where it had always formerly been, to Java itself, and foreign buyers have flocked to the Javan centers where it was stored. The United States has become one of the largest consumers of Java rubber and is likely to remain so after the war.

Rice, which is to the Orientals what bread is to the Western nations, is the staple crop of the native Javans. Immense quan-

* Excerpted from *The Americas*, November, 1917.

tities are raised and consumed on the small farms. Curiously, however, the best grades are always exported and enter the world's markets, while to take their place a low grade of rice is imported from China, Burma, and the neighboring islands.

Coffee, of the well-known Java variety, is one of the oldest crops raised on the island. Coffee is often planted on rubber estates, between the rows of young rubber trees. In 1914 there were 140,000 acres planted with coffee alone. Tea is cultivated to some extent, on private plantations, and finds a market in Great Britain and Holland. Among the many other products of Java we may mention cinchona or Peruvian bark, which is used in making quinine. The plant was not introduced into the island until about 1854, but to-day Java is the world's chief source of quinine. The cocoanut palm is indigenous to the island, and the natives gather and bring in for sale quantities of cocoanuts. The dried meat of the cocoanut, copra, is exported to be used in making soap, candles, etc.

Java possesses very valuable forests, over which the government now exercises careful supervision. The most valuable are the teak forests, which cover over 275,000 acres. Among the mineral resources of Java are tin and petroleum.

The absence of any extensive manufacturing development causes Java to be a large importer of manufactured goods. It will surprise many to know that the island is the third largest importer of cotton goods in the world.

THE TIN PRODUCTION OF THE MALAY PENINSULA

THE Malay Peninsula lies at the southeastern corner of Asia and extends from 10° north latitude to the equator. The Dutch islands of Banka and Billiton are really an extended portion of the Malay Peninsula. The tin-bearing rocks of the peninsula continue into these two islands.

The tin of the Malay Peninsula has been mined since ancient times; in fact some very early Chinese records, dating from about 2000 B. C., state that tin was even then obtained from this region. These mines have long led the world in the production of tin. Up to very recent times it has been mined in a crude and wasteful manner. Thousands of tons of low grade "overburden" were cast away in the haste to reach the richer deposits. In large areas possible ore lands still lie unexplored and untested. Many places

which were passed by as useless in the past can now be worked at a profit. Real scientific development is just starting; of 17,000,000 acres which may contain tin ore only 300,000 acres, or two per cent, have been set apart for mining.

In the first part of the nineteenth century deposits of tin were discovered on Banka Island; in 1820 1200 tons were mined there and by 1900 12,000 tons were produced. Since then the production has decreased. About the middle of the nineteenth century tin was found in Billiton; between 1850 and 1900 the out-put increased from 40 to 3000 tons a year.

The tin production of the Malay Peninsula is, however, by far the most important. Out of the world's tin supply of somewhat over 110,000 tons in 1915, British Malay produced 68,000 tons. Thus the Malay mines control the tin market of the world. The British control of the mines and the ever increasing demand for tin has caused a rapid growth in the mining industry. In the last 25 years the out-put has increased from 29,000 to 68,000 tons (1890-1915) or almost 150 per cent. To produce this 170,000 Chinese are continuously employed in the tin mines of the Federated Malay States. At the price of $630 per ton the tin production of the peninsula amounts to $43,000,000 and yields a duty of about $5,000,000.

Bolivia is the second largest tin producing country in the world, yielding over 25,000 tons annually. The famous old mines of Cornwall, England, are still yielding 6000 tons a year. Australia produces 5000 tons or more annually; South Africa and China each produce a few thousand tons. Tin is one of the very few metals which the United States does not mine in important quantities, our yearly output being only about 50 tons. F. W.

THE VALUE OF GEOGRAPHY

"From the standpoint of children's educational needs, or of international world-wide business relations, or of the ethical brotherhood of man, or from all of these and their connections, the fact must and will be recognized that the study of the world is the all-inclusive and all important aspect of Geography apart from the study of one's own locality. There is no other possible way than by the study of world Geography of cultivating wide observation, safe imagination, sound reasoning, and adequate sympathy." [*Report on Geography, New England Association of Superintendents*, 1901.]

PRODUCTION AND CONSUMPTION OF COAL

COAL is our commonest and most valuable and most wastefully used industrial resource. It is most valuable because it gives greater worth to all other resources, by enabling us to utilize them to our comfort. We can get along without gold and silver, but we don't waste them. We can't very well get along without coal, and we do waste it.

The Committee on Coal Conservation of the National Chamber of Commerce calls the attention of coal users once more to the fact that the demand is unprecedented. The mines are producing more coal than they ever before shipped, and the railways are hauling a larger number of cars than they handled in any previous year. Industrial activity of kinds to which coal is essential has reached a height we have never previously known.

All of this activity which relates directly to war will receive the coal which it needs. There is no room to doubt that. The Fuel Administrator declares he is determined that, for war purposes, public utilities, and domestic use, there will be available sufficient coal. The real question arises in connection with the requirements of industries which are not directly related to war.

In 1916 the United States broke all previous records, by producing and using 500,000,000 tons of bituminous coal. In the twelve months ending with December, 1917, it produced about 550,000,000 tons. The Fuel Administrator estimates that the present demand is at the rate of 600,000,000 tons a year. This estimate is based upon a demand from munitions plants that is greater by a third to a half than a year ago, an increase in the Government's requirements from two million to eight million tons a year, and demands of public utility plants that have risen by a third.

The difference of 50,000,000 tons between the estimated supply and demand will have to be made up by enlarging production, facilitating transportation and stopping the waste. The most patriotic thing to do, and probably the only thing which will avail much, seeing that the railroads have apparently about reached the limit of their capacity, is to stop the waste.

For the calendar year of 1915 the Geological Survey gathered data which indicates roughly the relative importance of the ways in which bituminous coal is used. The percentages of the total consumption in 1915 were as follows:

Industrial Steam Trade	33%
Railroad Fuel	28%
Domestic and Small Steam Trade	16%
Manufacture of Beehive Coke	9%
Manufacture of By-Product Coke	4%
Exports	4%
Steamship Bunkers at Tidewater	2%
Used at Mines for Steam and Heat	2%
Manufacture of Coal Gas	1%

Coal is produced in thirty states. The relative importance of these states was expressed by the Geological Survey in percentage of all coal produced (bituminous and anthracite) as follows for 1915:

Pennsylvania:			
Anthracite	16.8%	Utah	.6%
Bituminous	29.7%	Washington	.6%
West Virginia	14.5%	Montana	.5%
Illinois	11.1%	Texas	.4%
Ohio	4.2%	Arkansas	.3%
Kentucky	4.0%	Michigan	.2%
Indiana	3.2%	Iowa	1.4%
Alabama	2.8%	Kansas	1.3%
Colorado	1.6%	Wyoming	1.2%
Virginia	1.5%	Tennessee	1.2%
Maryland	.8%	North Dakota	.1%
Oklahoma	.8%	Georgia, Oregon, California, Idaho, Nevada, South Dakota	.1%
Missouri	.8%		
New Mexico	.7%		

The United States produces more coal than any other country. The latest statistics available with a degree of completeness are for 1914. In that year, in a world production in the neighborhood of 1,345,000,000 net tons, the United States contributed 38 per cent, Great Britain 22 per cent, and Germany 20 per cent.

In 1913, for which estimates are more complete, the production of all kinds of coal by the more important countries was approximately as follows:

	Net Tons		Net Tons
United States	569,000,000	France	45,000,000
Great Britain	321,000,000	Russia	35,000,000
Germany	305,000,000	Belgium	25,000,000
Austria-Hungary	59,000,000	Japan	23,000,000

[*The Nation's Business* for Jan. 1918.]

MINNEAPOLIS OUTLINE FOR TEACHING JAPAN AND CHINA

THE new course of study prepared by a selected committee of Minneapolis teachers and principals has been printed and is undergoing trial and criticism preparatory to revision and final adoption. It is a good piece of work and, in its final form, will doubtless be still further strengthened. The following outline covers a small part of the first term's work of the seventh grade:

JAPAN

The Japanese Islands have been called the British Isles of the Pacific. Why?
(Compare throughout with British Isles.)

I. Location and extent
   1. In path of trade between two continents
   2. Extent along Pacific coast
   3. Number of islands
   4. Compare in area with Minnesota

II. Surface and coast
   1. Character of surface
   2. Coast indentations and harbors
   3. Drainage systems and uses

III. Climate
   1. Great extremes
   2. Effects of heavy mid-summer rains

IV. Occupations
   1. Agriculture
      A. Method and stage of cultivation
      B. Extent of cultivated lands
      C. Products
         a. Variety
         b. Most valuable crop, amount of arable land in paddy fields; describe paddy fields
         c. Areas of tea culture
         d. Rank in silk production; state influence on this industry of monsoons, mountainous character of country, and dense population
   2. Fishing
      A. Extent of industry and reason
      B. Uses of product, lack of waste

3. Mining
   A. Kinds of minerals, value of copper
   B. Effects of lack of coal and iron
4. Forestry
   A. Extent of forest areas
   B. Necessity for cultivation and care
   C. Products
      a. Importance and care of bamboo
      b. Lacquer and its value
      c. Camphor tree culture (Note recent development in United States)
5. Manufacturing
   A. Great economic necessity; necessity for import of raw material and food
   B. Power development
   C. Abundance of cheap labor, results
   D. Products and their uses
6. Commerce
   A. Oriental means of transportation
   B. Development of modern methods

V. People and Government
1. Ability to support dense population
2. Characteristics: effect of powers of imitation and initiative
3. Reason for location of settlement
4. Government
5. Education, general and advanced

VI. Cities
Osaka, cotton and silk goods
Kioto, tea and art wares
Yokohama, seaport
Tokyo, capital
Nagoya, center of porcelain manufacture

VII. Colonies
Korea, food, timber, and minerals
Manchuria, great resources

VIII. Suggestive Questions and Problems:
Why are so few animals raised in Japan?

How did the size and location of Japan aid in her industrial revolution?

What economic problems were met by Japan with the taking over of Korea and with the gaining of concessions in Manchuria?

Name some of the uses of paper in Japan.

The great point of difference between Japan and Britain is the production of coal and iron. How is Japan attempting to overcome this difference?

Why is Japan even more dependent upon manufacturing than Great Britain?

Why have we not succeeded in introducing silk and tea production into the United States?

Why is a crop failure more serious in a country where there is no large animal industry than where there is one?

Explain the sudden entrance of the soy bean into European commerce.

Why do Japanese celebrate the birthday of Commodore Perry?

IX. Drill

Locate and know something about:

Formosa	Honshu	Seoul
Yokohama	Kyoto	Fujiyama
Tokyo	Nagoya	Nagasaki
Osaka	Korea	

CHINA

China, a country of great natural resources and vast extent, has lacked means of communication with the outside world. State the results.

1. Compare China's position, and area with the United States.
    1. Note the water boundaries
    2. Communication with advanced nations
    3. Extent and position of territory

II. Surface, coast, and climate
    1. Contrast with United States
        A. As to location and trend of mountain areas
        B. Distribution and character of drainage basins
        C. Variety in climate
        D. Influence on products of prevailing winds
        E. Coast as affecting climate and trade
    2. Location and extent of desert areas, mountain ranges, alluvial plains, loess deposits, arid and semi-arid plains

III. People and government
    1. Characteristics of people; reason for
        A. Willingness to work
        B. Skill in spite of scarcity of opportunity
    2. Condition of government

IV. Industries and products
1. Agriculture
A. Industries peculiar to China; effects of summer rain and dense population on industry
a. Tea production, vast amount of labor
b. Rice cultivation, its commercial and food value
c. Silk culture
B. Peas and beans and their place in China's diet
C. Grains, other than rice
2. Forestry, great range and variety, from bamboo to spruce
3. Mining
A. Enormous possibilities
B. Standing in coal and iron production
C. Compare with United States in output
4. Animal industry
5. Fishing: Chinese fish culture, the best in the world
6. Commerce
A. Means and methods of transportation
B. Significance of caravan trade
C. Importance of Grand Canal
D. Reasons for extent of cart and wheelbarrow transport

V. Cities
Peking, capital and ancient city
Shanghai, world's greatest silk market
Hankau, tea market
Tientsin, treaty port at north terminus of Grand Canal
Canton, seaport of southern China

VI. Suggestive Questions and Problems:

State the connection between the summer rains and dense population of China.

What conditions have made Shanghai the greatest silk market of the world?

Why did an industrial revolution affect Japan sooner than China?

Why are the Chinese the best of laborers?

Chinese boats and carts use wind power where possible. Why?

Describe an irrigated paddy field.

What industrial changes may we look for in China in the near future?

Compare the southeastern and the northwestern parts of China in relation to density of population and development of natural resources. Explain.

What does the Great Wall of China tell us of China's ancient civilization?

What have western nations learned from China?

VII. Drill

Locate and know something about:

Peking	East China Sea
Great Wall	Hoang-ho
Shanghai	Yangtse-kiang
Canton	Tientsin
Grand Canal	Hong-kong
Lassa	Altai
Tibet	Gobi
South China Sea	Mongolia

MINIMUM ESSENTIALS IN PLACE GEOGRAPHY, 1ST TERM, 7TH GRADE

Be able to locate:

1. All the countries of Europe, the provinces of Canada, India, Australia, South Africa, Egypt, Chinese Empire, Guiana, Siberia, Belgian Kongo, Sahara.

2. Coast waters: Atlantic, Pacific, Indian and Arctic Oceans; Mediterranean, Red, Black, Baltic, North, Irish, White, Adriatic, Aegean, Marmora, South China, East China, Japan, Arabian, and Bering Seas; Bay of Biscay, English Channel, Gulf of Guinea, Bay of Bengal, Gulf of St. Lawrence, Bay of Fundy, Hudson Bay.

3. Straits: Dover, Gibraltar, Skagerrack, Kattegat, Dardanelles, Bosporus, Malakka, Bering.

4. Rivers: Thames, Mersey, Clyde, Seine, Rhone, Rhine, Elbe, Po, Tiber, Danube, Volga, Lena, Yenisei, Indus, Ganges, Brahmaputra, Yangtse, Hoang-ho, Amur, Ob, Murray, Darling, Nile, Kongo, Niger, Zambezi, St. Lawrence, Fraser, Mackenzie, Nelson.

5. Lakes: Geneva, Dead Sea, Baikal, Caspian, Aral, Tanganyika, Nyassa, Wener, Superior, Huron, Erie, Ontario, Winnipeg, Great Bear, Great Slave.

6. Canals: Suez, Manchester, Kiel, Sault Ste. Marie, Welland, Grand.

7. Mountains: Cheviot, Pyrenees, Alps, Apennines, Carpathians, Caucasus, Kiolin, Valdai Hills, Ardennes, Ural, Himalayas, Altai, Atlas, Australian Alps, Rocky.

8. Peaks: Blanc, Matterhorn, Jungfrau, Elburz, Everest, Fujiyama.

9. Islands: British, Malta, Sardinia, Sicily, Crete, Cyprus, Jersey, Isle of Man, Greenland, Iceland, Newfoundland, Prince Edward, Jamaica, Trinidad, Bermudas, Bahamas, Barbados, Azores, Madeira, Canary, St. Helena, Madagascar, Borneo, Java, Sumatra, New Guinea, New Zealand, Ceylon, Tasmania, Formosa, Honshu, Vancouver, Samoa.

10. Cities: locate and give an important fact:

London	Hamburg	Athens
Berlin	Rotterdam	Bombay
Paris	Glasgow	Sheffield
Vienna	Marseilles	Cardiff
Rome	Madrid	Ottawa
Petrograd	Copenhagen	Port Arthur
Constantinople	Hong-Kong	Karachi
Peking	Johannesburg	Colombo
Liverpool	The Hague	Kimberley
Naples	Trieste	Port Said
Montreal	Halifax	Vladivostok
Dublin	Warsaw	Ghent
Lisbon	Dresden	Prague
Venice	Manchester	Bergen
Moscow	Auckland	Goteborg
Alexandria	Winnipeg	Baku
Canton	Vancouver	Bucharest
Quebec	Tientsin	Amsterdam
Singapore	Delhi	Odessa
Cape Town	Zurich	Hankow
Birmingham	Oporto	Sydney
Munich	Osaka	Stockholm
Milan	Yokohama	Belfast
Lyon	Madras	Brussels
Bordeaux	Havre	Barcelona
Edinburgh	Christiania	Melbourne
Southampton	Cairo	Toronto
Tokyo	Shanghai	Irkutsk
Calcutta	Budapest	Batavia
Antwerp	Geneva	

THE CANAL IN OPERATION*

THE slides and other adversities encountered in the construction of the Panama Canal have apparently been overcome, and so the problems of the Canal shift from construction to operation. It must be maintained and defended, and it must handle

*From an article by Seymour Paul in *The South American*, Nov. 1917.

ships quickly and safely. And the ships that come here must enjoy every facility to assist their coming and going. That is why there is a coaling plant at Cristobal capable of giving ships coal just as fast as they can take it, why there is a dry dock a thousand feet long, the largest in the Western Hemisphere, at Balboa, with shops and cranes and all necessary adjuncts for repairs; that is why large fuel-oil plants as well as coal plants are situated at both ends; why there are thousands of feet of new wharfing space, and why the supply system is ready to furnish foodstuffs, meat and clothing, ice and cold storage, ships' gear and what-not—all to expedite traffic.

What of the traffic? In January, 1917, the Canal had its biggest month. One hundred and seventy-five ships made the transit, not including the ships in Government service at the Isthmus. Their aggregate net tonnage, according to the rules of measurement for the Canal, was over 561,000. They carried over 671,000 tons of cargo. The total length of all these ships was 61,189 feet. Placed stem to stern, they would have formed a solid line 11.6 miles in length.

From the time the Canal opened, on August 15, 1914, to the first of April of 1917, 3,249 ocean-going ships passed through it. Their aggregate net tonnage was 10,718,683, and the cargo they carried amounted to 13,453,386 tons. Suppose we reduce it to terms of railway traffic. In the year ending June 30, 1914, the total freight handled on all the railroads in the United States was 1,654,842,539 tons. During the fiscal year ending June 30, 1915, the cargo carried through the Canal amounted to 4,969,000 tons. The railroads handled in the year about 333 times what the Canal handled.

The railroads had 2,356,338 freight cars; they had an aggregate capacity of 94,253,520 tons, an average of 40 tons per car. The 4,969,000 tons of cargo going through the Canal would have filled 124,225 cars, one-nineteenth of all the freight cars in the country. The 124,225 cars, with their train-length taken at 42 feet, would form a solid train 998 miles in length. It would parallel the Canal over 19 times. It would reach nearly half way from Cristobal to New York. It lacks 94 miles of being long enough to fill a main line track from New York to Jacksonville, via Philadelphia, Washington, Richmond and Raleigh. It is longer than from Chicago to New Orleans by 58 miles, and would stretch ten times between New York and Philadelphia and leave 78 miles over.

The biggest single item of freight is nitrate from the fields of Chile. Up to the beginning of 1917 nitrate shipments through

the Canal had aggregated 2,691,532 tons—about one-fifth of all the cargo going through the Canal. This traffic has been going strong since the beginning of the war, which is to say throughout the time the Canal has been open; and of late it has been going stronger, as during the last half of 1916 the nitrates amounted to 1,145,445 tons. The war has stimulated this trade, and the traffic would have been even greater but for a relative scarcity of ships.

Coal has been the next item, aggregating 831,266 tons in the same time. The greater part of it has been shipped from Norfolk, Newport News, Baltimore, and New York to the west coast of South America, although a good deal of it has been handled westward in the United States coastwise trade, and British coal, principally for the Admiralty, has made up a considerable part of the trade.

Refined petroleum, next in order, with 624,325 tons, has been shipped principally from Atlantic and Gulf ports of the United States to the Far East, China and Japan having been the principal consumers.

Sugar, 578,388 tons, has been more extensively distributed than any of the foregoing. Nearly 40 per cent has been in the United States coastwise trade, mostly westbound; over 30 per cent has been raw sugar from the Far East to the United States; About 30 per cent has been from the west coast of South and Central America, divided about evenly in destination between the United States and Europe.

Other important articles are manufactured goods of iron and steel, lumber, barley, wheat, crude oil, iron ore, canned goods, coke, copper, railroad materials, raw cotton, machinery, miscellaneous manufactured goods, copper ore, flour, cacao, naptha, coffee, chrome ore, tin, wool, cement, and an infinite variety of lesser goods.

The traffic of the Canal has moved in very large part between well-defined trade areas. Summing up the movements both ways over the routes between these areas, the proportion may be indicated as follows: Between the United States and the west coast of South and Central America, 22.63 per cent; United States coastwise trade, 19.88 per cent; between the United States and the Far East, including Oceania, 16.43 per cent; between Europe and the west coast of Central and South America, 10.64 per cent; between Europe and the west coast of North America, 9.48; between the Atlantic terminus of the Canal and the west coast of South and Central America, 6.99 per cent; between Europe and the Far East, including Oceania, direct, 1.94 per cent.

CURRENT MATERIAL FOR THE GEOGRAPHY TEACHER

National Debts of the World

ABOUT three-fourths of the great total of 45 billion dollars of national indebtedness in 1913 was owed by European countries, the remainder being distributed among the other grand divisions.The 1913 debts of the European countries were in round terms $32,000,000,000, Asia $4,000,000,000, South America $2,300,000,000, North America $2,100,000,000, Africa $1,500,000,000, and Oceania $2,000,000,000. It is not possible to determine with accuracy the increase of the debts of the various grand divisions during the half century, in which the national debts doubled. Of the world's national debts in 1874, which aggregated at that time about 22½ billion dollars, about 15 billions were owed by European countries, and the remainder distributed among the other grand divisions, that of North America alone being about 3 billion dollars, the debt of the United States being at that time at approximately its high water mark following the Civil War.

Two-thirds of the great national debts of the world at the beginning of 1914 was owed by the countries which before the end of that year had entered upon a war which would double and treble, and perhaps quadruple, the enormous national debt then existing. Of the 45 billion dollars of national debts in existence at the beginning of the year 1914 no less than 34 billion dollars were owed by the countries which have since entered the war. France stood at the head of the list with an indebtedness of $6,346,000,000, Germany (including the German states) $5,027,000,000, Russia $4,536,000,000, Austria-Hungary $3,869,000,000, United Kingdom $3,486,000,000, Italy $2,921,000,000, Australia $1,433,000,000, Japan $1,241,000,000, United States $1,028,000,000, Portugal $948,000,000, Belgium $826,000,000, Turkey $624,000,000, Canada $483,000,000, New Zealand $438,000,000, Rumania $316,000,000 and Bulgaria $135,000,000. This list of countries whose total debts at the beginning of the present war were $33,657,000,000 includes only those which have actively participated in the fighting. In addition to this there are a half dozen countries—China, Siam, Brazil, Greece, Panama and Cuba—which have declared war but have not yet sent troops to enter upon its activities, and their debts at the beginning of the war, if included in the above aggregate, would show that the nations participating actively or prospectively in the present war had already, before this war began, a total of 36 billion dollars of national debts out of a world total of 45 billion dollars. To put it in a single sentence, the world's national

debts at the beginning of the present war aggregated 45 billion dollars, and of that enormous total three-fourths were owed by the nations thus entering upon a new war, which has now more than doubled, and will probably treble their large indebtedness of 36 billions which existed at the beginning of the war.

[O. P. Austin in *The Americas* for Nov. 1917.]

The People and Government of Afghanistan

The people, products of this unkindly soil, are hardy (the weaklings die,) stubborn, brave, and so treacherous that the word gains an intensive meaning when applied to them. Towards strangers they are servile or hectoring, the probable result in personal financial profit being the sole rule of conduct. Luxury, even comfort, to them is often what we call vice. Ingenious in sensuality, they are intriguers by instinct, while running through their whole character there is a wonderful arrogance, vindictiveness and cruelty. Born and bred amidst an unceasing struggle with nature for the means of life, they live hard and they die hard. In spite of the rigid, stern and narrow ceremonialism of their Mohammedan religion, Afghans are not fanatical; most creeds are tolerated, the chief exception being Christianity. Hatred of Christians springs less from questions of dogma and faith than because the blood of ancestors and tribesmen cries for vengeance; and beeause of the supposed determination of the British Christians to enslave the Afghan people and force them to "carry loads." Unlike the grasp of an Amir, which now and again seizes upon an individual while the crowd escapes, British rule is feared as a wrought-iron system regulated by an inexorable screw called "law," which squeezes free hill-men into the pulp of which slaves are made. The government of the country is an extreme Eastern Absolutism wherever or whenever the different tribes are cowed. Regular authority is based upon the dumb terror inspired by hideous and dramatic punishments. Tribute is oftentimes collected by armed forces after much bloodshed. An Amir of Afghanistan must be merciless, and his people must believe him to be the implacable enemy, secret or declared, of the government of India. [Mill's International Geography.]

War Attitude of Latin America

Of the six republics of Central America, one (Panama) has declared war against Germany, and four others have severed relations with that country. Of the three republics in the West Indies, one (Cuba) has declared war, and one (Haiti) has severed relations with Germany. Of the 10 South American repub-

lics, one (Brazil) has declared war, four (Peru, Bolivia, Uruguay, Ecuador) have severed relations with Germany, one (Chile) has revoked her neutrality, and two (Argentina and Paraguay) have taken an open but unofficial stand in favor of the Allies. Mexico, Colombia, and Venezuela have taken no action and are officially neutral. None of the three is at present warmly friendly to the United States.

A COMMUNICATION

The Question of the Bounds of Geography

Editor of The Journal of Geography:—

If you will permit me I would like to discuss briefly through the pages of the Journal certain parts of your interesting paper which was printed in the December number, believing that through discussion progress results.

For myself as a teacher and student of geography I cannot admit the validity of the latter half of the following sentence appearing upon the first page of the article referred to: "There is no doubt about the kind of material that occupies the middle of the field of geography, but no man living would attempt to say where the outer limits of this field lie."

That there has been no agreement among geographers or teachers as to the limits or bounds of geography I am sure we will all be ready to admit, but that this haziness is necessary, or that it is inherent in the nature of the subject is a very different matter. If there is any unity in geography or any basic idea underlying the conception; if it is a real science, as I believe it to be, its bounds should be as clear as those of chemistry or biology. If geography is to continue to claim an important place in our schools we should be able to distinguish it from other subjects. Because almost every maker of school programs as well as almost every geography teacher has confused geography with the different sciences, with nature study, and with information about various industrial processes, is far from signifying that there is not a definiteness in the concept.

Very illuminating thoughts along this line, which I venture to say have been read by very few, are to be found in an article by Prof. W. M. Davis in the *Scientific American Supplement* for January, 1904.

My own practice has been for some years to define geography in much the same manner as Prof. Davis, although I would, perhaps, go a little farther than he does in limiting the field and making it more clearly defined.

According to this view the compiling of lists of "minimum essentials in place geography," to quote an expression from your article above referred to, should have no place in school geography. This sort of work, like the details of industrial processes, is not true geography. If we wish to continue to make geography a catch-all for all sorts of information which we do not know where else to place, then it would be all right to encumber geography with such things. But until we recognize that geography is the study of relations instead of the acquirement of mere facts it will never hold the honorable place which it should in our schools.

In the short space of this criticism I cannot go into an exposition of my reasons for believing that geography has a definite content and definite boundaries. A department of geography under my direction has recently been added to the *Western Journal of Education* and here I hope to work out my particular point of view.

H. W. FAIRBANKS,
Supervisor Geography, Berkeley Schools, Cal.

NEW YEAR RESOLUTIONS FOR THE GEOGRAPHY TEACHER

1. Since most of the world is engaged in a great war to prevent wars, I will remind myself continually that, as a geography teacher, I have much to do in furthering the cause for which men are giving their lives: therefore, I will teach very earnestly the larger geographic truth that humanity, with its common needs and common interests, is really at one, and that the good of all is the good of each.

2. I will remember that geography is a human study—it deals with real people who have a real setting.

3. I will strive to know as broadly as possible each people about whom I teach, so that I may be fair and honest in my representations concerning them.

4. I will do everything in my power, first, to develop the imagination of my pupils; second, to help them gain power to trace causal relationships from geographic facts.

5. I will select with unusual care the geographic facts to be taught, remembering that "facts are stupid things until they are brought into connection with some general law."

6. To enlarge my own geographic field, I will make at least one new regional study a semester, that is, I will select one region about which I will center my reading for that time.

7. I will review constantly my own place geography, and will add a few names every week to my "definite location group."

ROSE B. CLARK, Peru, Neb.

RECENT PUBLICATIONS

TOPOGRAPHY AND STRATEGY IN THE WAR.. By Douglas W. Johnson. Henry Holt and Company, New York, 1917, pp. x+211. 18 diagrams and maps, and numerous illustrations. $1.75 net.

The author states in his preface that "he was particularly anxious to discover how far military operations are still affected by the element of terrain" and he concludes that there is "ample indication that the role played by land forms in plans of campaign and movements of armies is no less important today that in the past."

He makes it clear that the four escarpments with their steep faces toward Germany and their gentle slopes toward the Paris Basin have enabled the French to effectively block the German advance at all points south of Verdun. He makes it equally clear why the Germans chose the easy path across the plains of northern France for making their first impetuous drive to reach Paris. The failures of the repeated attacks upon Verdun are interpreted in the light of the configuration of the land surrounding the great French fortress. The intricate network of canals and drainage ditches in northern Flanders, and the water-soaked land, baffled the Germans in the attempted drive upon Calais and have made all fighting in this region extremely laborious.

Broad rivers with swampy banks, lakes and marshes, and mud have played a constant part in all operations on the eastern front. The Carpathian Mountains with their few passes, narrow defiles and many ranges prevented the Russians from clinching their victory over the Austrians in the early part of the war. When one realizes that practically every topographical advantage on the Austro-Italian boundary lies with the Austrians, he wonders that the Italians achieved as much as they did. The last four chapters deal with the various campaigns in the Balkans.

The book is an exccellent piece of work. Rarely if ever does the author stretch a point to give any undue support to his main thesis. By means of maps showing the topography of the regions which are under consideration, he shows point by point how the topography influenced and often decided military movements. It is true that the book largely ignores elements in the strategy of the war which do not arise from topography; but the book does not purport to do otherwise. The thoughtful reader understands this. The book will stand as one of the permanently valuable contributions to the history of the war. R. H. W.